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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Ronald L. Gordon

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EXAMINER

RASHID, DAVID

ART UNIT

PAPER NUMBER

2624

MAIL DATE

DELIVERY MODE

08/04/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/708,515	Applicant(s) GORDON ET AL.	
	Examiner DAVID P. RASHID	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 May 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-10,12-16 and 18-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-10,12-16 and 18-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Amendments

[1] This office action is responsive to the claim amendment received on May 27, 2008.

Claims 1, 3-10, 12-16, and 18-25 remain pending; claim 17 cancelled; claims 21-25 new.

Claim Rejections - 35 USC § 101

[2] 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

[3] The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Section IV.C, reads as follows:

While abstract ideas, natural phenomena, and laws of nature are not eligible for patenting, methods and products employing abstract ideas, natural phenomena, and laws of nature to perform a real-world function may well be. In evaluating whether a claim meets the requirements of section 101, the claim must be considered as a whole to determine whether it is for a particular application of an abstract idea, natural phenomenon, or law of nature, rather than for the abstract idea, natural phenomenon, or law of nature itself.

For claims including such excluded subject matter to be eligible, the claim must be for a practical application of the abstract idea, law of nature, or natural phenomenon. Diehr, 450 U.S. at 187, 209 USPQ at 8 ("application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection."); Benson, 409 U.S. at 71, 175 USPQ at 676 (rejecting formula claim because it "has no substantial practical application").

To satisfy section 101 requirements, the claim must be for a practical application of the Sec. 101 judicial exception, which can be identified in various ways:

The claimed invention "transforms" an article or physical object to a different state or thing.

The claimed invention otherwise produces a useful, concrete and tangible result, based on the factors discussed below.

[4] **Claims 1, 3-9, and 21-25** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 1, 3-9, and 21-25 recites the mere manipulation of data or an abstract idea, or merely solves a mathematical problem without a limitation to a practical application. A practical application exists if the result of the claimed

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invention is “useful, concrete and tangible” (with the emphasis on “result”)(Guidelines, section IV.C.2.b). A “useful” result is one that satisfies the utility requirement of section 101, a “concrete” result is one that is “repeatable” or “predictable”, and a “tangible” result is one that is “real”, or “real-world”, as opposed to “abstract” (Guidelines, section IV.C.2.b)). Claims 11-17 and 19-20 merely manipulates data without ever producing a useful, concrete and tangible result.

Claims 1, 3-9, and 21-25 are rejected under 35 U.S.C. 101 as being directed to non-statutory subject matter because the claimed invention is directed to a judicial exception and is not directed to a practical application of such judicial exception (though the claims produce what is considered a useful and concrete result, the claims do not require any physical transformation and the invention does not produce a tangible result because there is no physical element).

MPEP SECTION 2106 (IV)(C)(2)(b)(2) titled “TANGIBLE RESULT” reads as follows:

...the tangible requirement does require that the claim must recite more than a 35 U.S.C. 101 judicial exception, in that the process claim must set forth a practical application of that judicial exception to produce a real-world result. Benson, 409 U.S. at 71-72, 175 USPQ at 676-77 (invention ineligible because had “no substantial practical application.”).

and MPEP SECTION 2106 (II)(C) reads as follows:

As a general matter, the grammar and intended meaning of terms used in a claim will dictate whether the language limits the claim scope. Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation. The following are examples of language that may raise a question as to the limiting effect of the language in a claim:

- (A) statements of intended use or field of use,
- (B) “adapted to” or “adapted for” clauses,
- (C) “wherein” clauses, or
- (D) “whereby” clauses.

For example, the method of independent claim 1 is directed to the actions of “creating a layout”, “creating Voronoi cells”, “determining bisectors”, “identifying different types of bisectors”, and “creating sub-resolution assist features” which does not reside on any physical element (e.g. display or memory) and is free from any “real-world result” as there may be no

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“real-world” application. “[C]reating a layout of spaced integrated circuit shapes to be projected via the photomask” (*emphasis added*) is intended usage, though a separate step of “projecting said layout of spaced integrated circuit shapes via photomask” may be a valid physical step. Claims 3-9, and 21-24 are rejected for failing to cure the deficiencies of claim 1; claim 25 is rejected for analogous of claim 1.

In order to for the claimed product to produce a “useful, concrete and tangible” result, recitation of one or more of the following elements is suggested:

- The manipulation of data that represents a physical object or activity transformed from outside the computer.
- A physical transformations outside the computer, for example in the form of pre or post computer processing activity.
- A direct recitation of a practical application;

Applicant is also advised to provide a written explanation of how and why the claimed invention (either as currently recited or as amended) produces a useful, concrete and tangible result.

[5] **Claims 16 and 18-20** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 16 cites “[a]n article of manufacture comprising a computer-usable medium...” (*emphasis added*) but it is unclear what a “computer-usable medium” is (as it could be non-statutory subject matter supported by the original disclosure).

Claims 18-20 rejected for failing to cure the deficiencies of claim 16.

Claim Rejections - 35 USC § 112

[6] The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

[7] **Claims 1, 3-9, and 21-25** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

(i) Claim 1, l. 10 cites “based on the vertices” (*emphasis added*), l. 18 cites “the second vertex”, and l. 26 cites “the adjacent shape edges” that all lack antecedent basis. The Examiner also questions how many vertices does each “different type of bisector[[s]]” have so that it can match the different types of bisectors given later in the claim?

(ii) Claim 1, l. 10 cites “identifying different types of bisectors based on the vertices thereof...[then] creating sub-resolution assist features...based on the different types of bisectors”. However, the Examiner does not know whether the three types of bisectors given later in the claim (starting at l. 16) are the ones being identified. It is suggested to add “identifying different types of bisectors based on the vertices thereof consisting of a first type of bisector, a second type of bisector, and a third type of bisector; and”

(iii) Claims 1 does not indicate how many bisector’s in each type of bisectors are needed to be classified. For example, does the first type of bisectors require two or more bisectors to be classified as a first type of bisector, or can one bisector be classified a first type of bisector. The claim language is written in such a way to allow both interpretations, as “if the bisectors are of a first type of bisectors” (*emphasis added*)? “[T]he bisectors” could be in reference to a collection of all possible bisectors, or it could be the two or more bisectors required to define “a first type of bisectors”. In other words, the “first type of bisectors” could be only one bisector each with its two end-vertices, a collection of the one-bisectors being the “first type of bisectors”, OR “the first type of bisectors” might require at least two bisectors each.

Claims 10, 16, and 25 contains equivalent arguments with respect to claim 1. **Claims 3-9 12-15, and 18-24** are rejected for failing to cure the 112 deficiencies of claims 10, 16, and 25.

[8] The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

[9] **Claims 16 and 18-20** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 16 and 18-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 16 cites “[a]n article of manufacture comprising a computer-usable medium...” (emphasis added) but it is unclear what a “computer-usable medium” is (as it could be non-statutory subject matter supported by the original disclosure). Claims 18-20 rejected for failing to cure the deficiencies of claim 16.

Claim Rejections - 35 USC § 103

[10] The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

[11] **Claim 25** is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2004/0005089 (filed Jan. 31, 2003, *hereinafter* “Robles et al.”) in view of U.S. Patent No. 6,178,539 (issued Jan. 23, 2001, *hereinafter* “Papadopolou et al.”) and U.S. Pub. No.2002/0155357 (filed Apr. 18, 2001, *hereinafter* “LaCour”).

Regarding **claim 25**, while *Robles et al.* discloses a method of creating a photomask layout (fig. 5) for projecting an image of an integrated circuit design (¶¶0003-0004) comprising:

creating a layout (fig. 3) of spaced (fig. 3, item 315) integrated circuit shapes (fig. 3, items 310, 320) to be projected via the photomask;

creating bisectors (“centered between them” and “at some predetermined distances” in ¶0017 for the SRAF’s to be placed) next to the spaced integrated circuit shapes;

determining bisectors (“centered between them” and “at some predetermined distances” in ¶0017) between adjacent ones (fig. 3) of the spaced integrated circuit shapes, the bisectors comprising locus of points equidistant from edges of the adjacent spaced integrated circuit shapes (“SRAF 335 centered between them”, ¶0017 suggested that the bisector from which the SRAF has been placed is equidistant because it is “centered”, as also supported in fig. 3) and defining shared boundaries (the bisectors from which SRAF’s are placed “define” shared boundaries, seeing an SRAF tells one of ordinary skill in the art that there is a shared boundary between the two edges); and

creating sub-resolution assist features (fig. 3, items 335, 355) along at least some of the bisectors between the adjacent ones of the spaced integrated circuit shapes, the sub-resolution assist features (fig. 3, items 335, 355) extending along the bisectors beyond (both SRAF items 335 and 355 extend collectively beyond item 320) an adjacent spaced integrated circuit shape (fig. 3, item 320), *Robles et al.* does not teach

- (i) creating Voronoi cells around the spaced integrated circuit shapes;
- (ii) the bisectors defining shared boundaries of the adjacent Voronoi cells;
- (iii) extending a SRAF along a bisector beyond an adjacent spaced integrated circuit shape; and

(iv) whereby each sub-resolution assist feature has a length at least five times its width, such that, those that violate this rule are deleted.

Papadopoulou et al. discloses determining critical area for circuit layouts using Voronoi diagrams (fig. 22) that teaches

creating a layout of spaced integrated circuit shapes (polygons in fig. 5);

creating Voronoi cells (fig. 5) around the spaced integrated circuit shapes;

determining bisectors (the bold lines of fig. 5; fig. 4 arrow) between adjacent ones of the spaced integrated circuit shapes, the bisectors comprising locus of points equidistant (5:66-6:2) from edges of the adjacent spaced integrated circuit shapes and defining shared boundaries (defining the shared boundary is the bold bisector line/arrow itself in fig. 4, fig. 5, and so forth) of adjacent Voronoi cells,

wherein the bisectors between adjacent ones of the spaced integrated circuit shapes extend beyond an adjacent integrated circuit shape (fig. 11, lowest horizontal bisector is longer in length than the immediate circuit shape above it).

It would have been obvious to one of ordinary skill in the art at the time the invention was made

(i) for the method of *Robles et al.* to include creating Voronoi cells around the spaced integrated circuit shapes as taught by *Papadopoulou et al.*;

(ii) for the bisectors at predetermined distances of *Robles et al.* to be the bisectors determined from the Voronoi cells as taught by *Papadopoulou et al.*; and

(iii) for the SRAFs of *Robles et al.* to be placed on the Voronoi cell bisectors of *Papadopoulou et al.* in such a way as to extend beyond an adjacent integrated circuit shape (as the Voronoi cells already extend beyond the integrated circuit shapes) as “[the present disclosure

further describes a method for speeding up the grid method of Wagner and Koren, in the above referenced article. The method is based on a low polynomial algorithm to compute critical area for shorts accurately in irregular rectilinear layouts.”, *Papadopoulou et al.*, 5:14-19 and that “[the method is presented for rectilinear layouts but it is extendible to general layouts.”, *Papadopoulou et al.*, 5:13-14 and “for computing critical area for shorts of a layout, in accordance with the present invention, includes the steps of computing a Voronoi diagram for the layout, computing a second order Voronoi diagram to arrive at a partitioning of the layout into regions, computing critical area within each region and summing the critical areas to arrive at a total critical area for shorts in the layout.”, *Papadopoulou et al.*, 2:58-64.

LaCour teaches deleting sub-resolution assist features having a length at least five times its width (e.g., items 718-724 at fig. 7a are deleted as shown in fig. 7b, and have a length at least five times their width).

It would have been obvious for the method of *Robles et al.* in view of *Papadopoulou et al.* to include deleting sub-resolution assist features having a length at least five times its width as taught by *LaCour* “to improve lithography tools to improve the fidelity of the lithography process.”, *LaCour*, 5:3-4 and not removing those sub-resolution assist features “could cause an artifact to be printed at the intersections and result in a loss of fidelity in printing the circuit pattern”, *LaCour*, 9:3-12.

Allowable Subject Matter

[12] **Claims 10 and 12-15** would be allowable if rewritten or amended to overcome the rejections under 35 U.S.C. 112 set forth in this Office action.

[13] **Claims 1, 3-9, 16, and 18-24** would be allowable if rewritten or amended to overcome the rejections under 35 U.S.C. 112 and 35 U.S.C. 101 set forth in this Office action.

Response to Arguments

[14] Applicant's arguments filed on May 27, 2008 have been respectfully and fully considered, and found persuasive.

Summary of Remarks regarding claims 1, 3, 8-10, 12, 16, and 18:

Applicants argue that Robles does not disclose or suggest Voronoi cells, and does not use bisectors that define shared boundaries of adjacent Voronoi cells. Again, Robles discloses SRAF 335 that does not extend beyond feature 310 or 320. (Robles, Fig. 3.) It only discloses that "edges 330 and 340 receive SRAF 335 centered between them." (Robles, paragraph 0017.) Papadopoulou does not overcome this deficiency since it is limited to the use of Voronoi diagrams to compute critical areas for shorts between different conducting regions of a layout. Papadopoulou does not use any boundaries of Voronoi cells to create sub-resolution assist features, as in applicants' claimed invention. Accordingly, applicants continue to submit that one of ordinary skill in the art would not look to combine the Robles and Papadopoulou references. (Applicant Resp. at 12-13, May 27, 2008.)

Neither Robles nor Papadopoulou, alone or in combination, disclose or suggest creating Voronoi cells around spaced IC shapes, determining bisectors representing defined shared boundaries of adjacent Voronoi cells (and are equidistant from edges of adjacent IC shapes), whereby different types of bisectors are determined based on the vertices thereof. As such, neither Robles nor Papadopoulou, alone or in combination, disclose or suggest creating SRAFs between adjacent ones of the spaced IC shapes based on these different types of bisectors. (Resp. at 15)

The Examiner has already recognized that Robles in view of Papadopoulou does not teach identifying different types of vertices for the bisectors. To overcome this deficiency, the

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Examiner cites LaCour, asserting that in accordance with dictionary definitions, LaCour discloses the use of vertexes and bisectors, and describes classification with the type of vertices of bisectors (e.g. a "+" shaped vertex is changed to "L" shaped). However, applicants point out that these bisectors of LaCour are not bisectors (and as such, vertexes) that define shared boundaries of adjacent Voronoi cells, as is currently claimed. Further, applicants submit that LaCour does not teach or suggest identifying different types of bisectors, and then creating SRAFs in locations based on these different types of bisectors, as is claimed. (Resp. at 15-16)

Examiner's Response regarding claims 1, 3, 8-10, 12, 16, and 18:

[15] Applicant's arguments with respect to claims 1, 3, 8-10, 12, 16, and 18 have been fully considered and are persuasive. The prior art rejections have been withdrawn. Applicant's arguments with respect to claims 5-6, 14-15, and 20 (Resp. at 14-15) and claim 7 (Resp. at 15) are hereby rendered moot.

Conclusion

[16] Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

[17] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578.

The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-74155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David P. Rashid/
Examiner, Art Unit 2624

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